REMARKS

Claims 10, 12-14, 17, 18 and 20-25 are pending in the present application. Claims 10, 13, 14 and 17 have been amended. Claims 21-25 have been presented herewith. Claim 11 has been canceled.

Personal Interview

Applicants respectfully acknowledge the courtesy extended by Examiner Rao during the personal interview conducted on April 19, 2006. During the personal interview, Applicant's representative described embodiments of the application which featured annealing the substrate after deposition at a temperature of at least 400°C. For example, as described on page 7, lines 13-22 of the application with respect to Figs. 14 and 15, after depositing the anti-reflection film, annealing is carried out at a high temperature of at least 400°C to promote absorption of Si into the Al_3Ti film. As a result of this annealing, the Al_3Ti film coming into contact with the Al film absorbs Si in the Al film, which reduces the amount of Si in the Al film, to suppress Si recrystallization growth in a step of cooling the wafer from the film formation temperature.

In contrast, in a conventional deposition method as described in the paragraph bridging pages 1 and 2 of the Description of the Related Art section of the application, at the time of depositing the Al film, deposited Si particles 6 as shown in Fig. 4 are dissolved in the Al due to high heating temperature of the deposition. In a subsequent process of cooling the wafer gradually from the deposition temperature, a nucleus of

remaining Si can not be dissolved.

In a further embodiment as described beginning on page 5, line 22 of the application with respect to Figs. 9 and 10, once deposition of the films is complete, the semiconductor substrate is annealed at a high temperature of at least 400°C. As a result of this annealing process, reaction between Al and Ti is promoted, and an Al_3Ti alloy layer is thus formed. The Al_3Ti film coming into contact with the Al film surface absorbs Si within the Al film, making it possible to prevent any Si deposit due to recrystallization.

Drawings

Enclosed are two (2) red-inked drawing Annotated Sheets, wherein Figs. 1-5 have been denoted as "PRIOR ART", as required by the Examiner. Also enclosed are two (2) drawing Replacement Sheets, incorporating the above noted corrections. **The Examiner is respectfully requested to acknowledge receipt and acceptance of the drawing Replacement Sheets.**

Claim Rejections-35 U.S.C. 103

Claims 10-15, 17, 18 and 20 have been rejected under 35 U.S.C. 103(a) as being unpatentable over the Wang reference (U.S. Patent No. 5,604,155) in view of Japanese Patent Publication No. 9-249966 (hereinafter referred to as the Soichi reference). This rejection, insofar as it may pertain to the presently pending claims, is

traversed for the following reasons.

The method of depositing a wiring thin film over a semiconductor substrate of claim 10 includes in combination "sputter depositing an Al_3Ti layer on said Ti layer using said Al_3Ti target"; "depositing an Al layer onto said Al_3Ti layer using an Al-Si-Cu target"; and "annealing said substrate at a temperature of at least 400°C after said depositing an Al layer and without cooling said substrate, to promote absorption of Si from said Al layer into Al_3Ti layer". Applicants respectfully submit that the prior art as relied upon by the Examiner does not make obvious these features.

As emphasized during the personal interview, Applicants respectfully submit that the prior art as relied upon does not anneal the substrate at a temperature of at least 400°C after depositing an Al layer and without cooling the substrate, as featured in claim 10. Particularly, on page 4 of the Final Office Action dated November 16, 2005, the Examiner has asserted that the prior art as combined discloses "after the sputter depositing, annealing said substrate at a temperature of at least 400°C to promote absorption of Si into said Al_3Ti layer. (Wang fig. 3 #108, col. 4 lines 25-26, col. 3 lines 5-6)". The Examiner has further asserted on page 4 of the Final Office Action that the Wang reference discloses annealing the substrate at 400°C in col. 2, lines 36-37, but not in the order recited in the claims. The Examiner has however alleged that the selection of any order of performing process steps is obvious in absence of new or unexpected results.

Regarding the specific portions of the Wang reference as relied upon to teach

annealing, Applicants emphasize that Fig. 3, step 108 of the Wang reference describes an Al/Si/Cu deposition at 450°C, not annealing after deposition. Column 4, lines 25-26 of the Wang reference as specifically relied upon by the Examiner also describes deposition of Al/Si/Cu layer 62, not annealing after deposition. Column 3, lines 5-6 of the Wang reference as specifically relied upon merely describes that precipitation of silicon nodules is due to the high solubility of Si and Al at high temperatures, but low solubility of Si and Al at low temperatures. This particular portion of the Wang reference as relied upon by the Examiner does not describe annealing.

Moreover, col. 2, lines 36-37 of the Wang reference as further specifically relied upon by the Examiner describes that the wafer is annealed after preliminary TiN layer 54 shown in Fig. 2 is grown. As described beginning in col. 2, line 56 of the Wang reference, the purpose of this anneal is to fill the grain boundaries of the Ti/TiN layers, so that the Al and Si do not diffuse together during the subsequent Al deposition step. The Examiner has suggested that it would have been obvious to reverse the order of this process. However, since this annealing as described in column 2 of the Wang reference must be performed on the TiN layer before the Al deposition step to prevent Al and Si from diffusing together, one of ordinary skill would have no motivation to modify the process as suggested by the Examiner to perform the annealing after the aluminum deposition step. That is, modifying the process to reverse the order of the annealing as suggested by the Examiner would render the annealing useless for the purpose intended. The Soichi reference as relied upon by the Examiner does not

overcome this deficiency of the Wang reference.

Applicants therefore respectfully submit that the prior art as relied upon by the Examiner taken singularly or together does not disclose or make obvious the method of depositing a wiring thin film of claim 10, and that this rejection, insofar as it may pertain to claims 10, 12 and 13, is improper for at least these reasons.

The method of forming a wiring film of claim 14 includes in combination "depositing an Al layer on said Ti layer using an Al-Si-Cu target"; "annealing the substrate at a temperature of at least 400°C after said depositing an Al layer and without cooling the substrate, to form an Al_3Ti layer on said Ti layer and to promote absorption of Si from said Al layer into said Al_3Ti layer"; and "pattern etching said Al layer after said annealing".

Applicants respectfully submit as emphasized above that the prior art as relied upon does not disclose or teach annealing the substrate at a temperature of at least 400° after depositing an Al layer without cooling the substrate. Applicant therefore respectfully submits that the method of forming a wiring film of claim 14 would not have been obvious in view of the prior art as relied upon by the Examiner taken singularly or together, and that this rejection, insofar as it may pertain to claim 14, is improper for at least these reasons.

The method of forming a wiring film of claim 17 includes in combination "depositing an Al_3Ti layer on said substrate using an Al_3Ti target"; "depositing an Al layer on said Al_3Ti layer using an Al-Si-Cu target"; "annealing the substrate at a

temperature of at least 400°C after said depositing an Al layer and without cooling the substrate, to promote absorption of Si from said Al layer into said Al_3Ti layer"; and "pattern etching said Al layer after said annealing".

Applicants respectfully submit that the prior art as relied upon by the Examiner does not disclose annealing the substrate after depositing an Al layer and without cooling the substrate, to promote absorption of Si from an Al layer into an Al_3Ti layer, as featured in claim 17. Applicants therefore respectfully submit that the method of claim 17 would not have been obvious in view of the prior art as relied upon by the Examiner taken singularly or together, and that this rejection, insofar as it may pertain to claims 17, 18 and 20, is improper for at least these reasons.

Claims 21-25

Applicants respectfully submit that claims 21-25, as respectively dependent upon claims 10, 14 and 17, distinguish over and would not have been obvious in view of the prior art as relied upon by the Examiner taken singularly or together, at least by virtue of dependency upon the above noted claims and by further reason of the features therein.

Conclusion

The Examiner is respectfully requested to reconsider and withdraw the corresponding rejection, and to pass the claims of the present application to issue, for at least the above reasons.

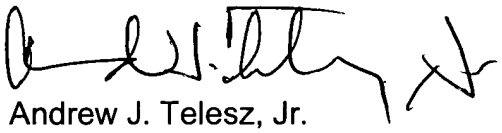
In the event that there are any outstanding matters remaining in the present application, please contact Andrew J. Telesz, Jr. (Reg. No. 33,581) at (571) 283-0720 in the Washington, D.C. area, to discuss these matters.

Pursuant to the provisions of 37 C.F.R. 1.17 and 1.136(a), the Applicants hereby petition for an extension of three (3) months to May 16, 2006, for the period in which to file a response to the outstanding Office Action. The required fee of $1020.00 should be charged to Deposit Account No. 50-0238.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment for any additional fees that may be required, or credit any overpayment, to Deposit Account No. 50-0238.

Respectfully submitted,

VOLENTINE FRANCOS & WHITT, P.L.L.C.



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Enclosures: Two (2) drawing Annotated Sheets
Two (2) drawing Replacement Sheets

ANNOTATED SHEET

Fig. 1

PRIOR ART

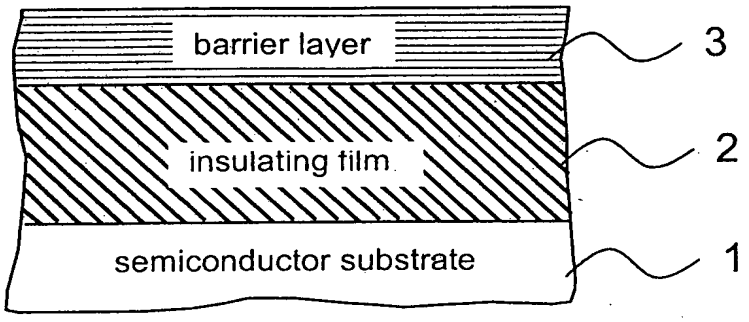


Fig. 2

PRIOR ART

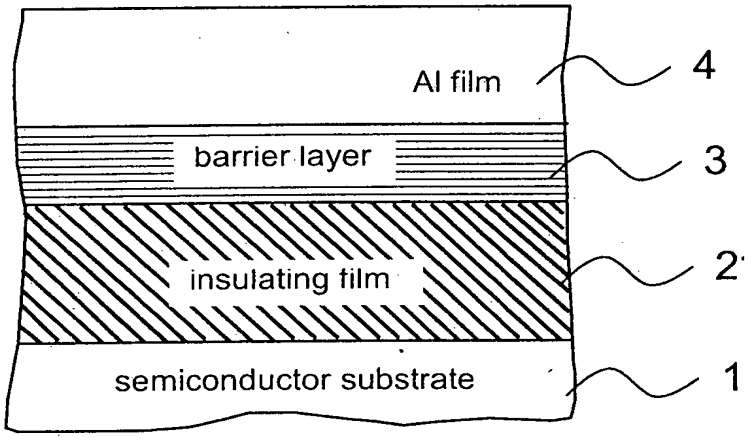
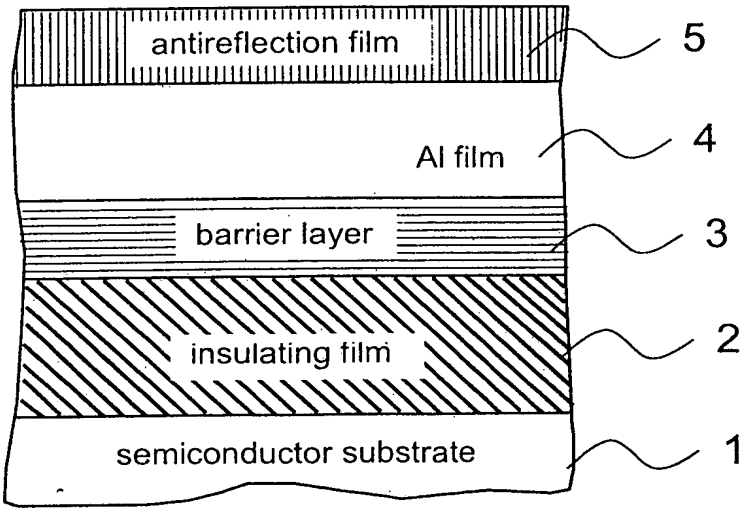


Fig. 3

PRIOR ART



ANNOTATED SHEET

Fig. 4

PRIOR ART

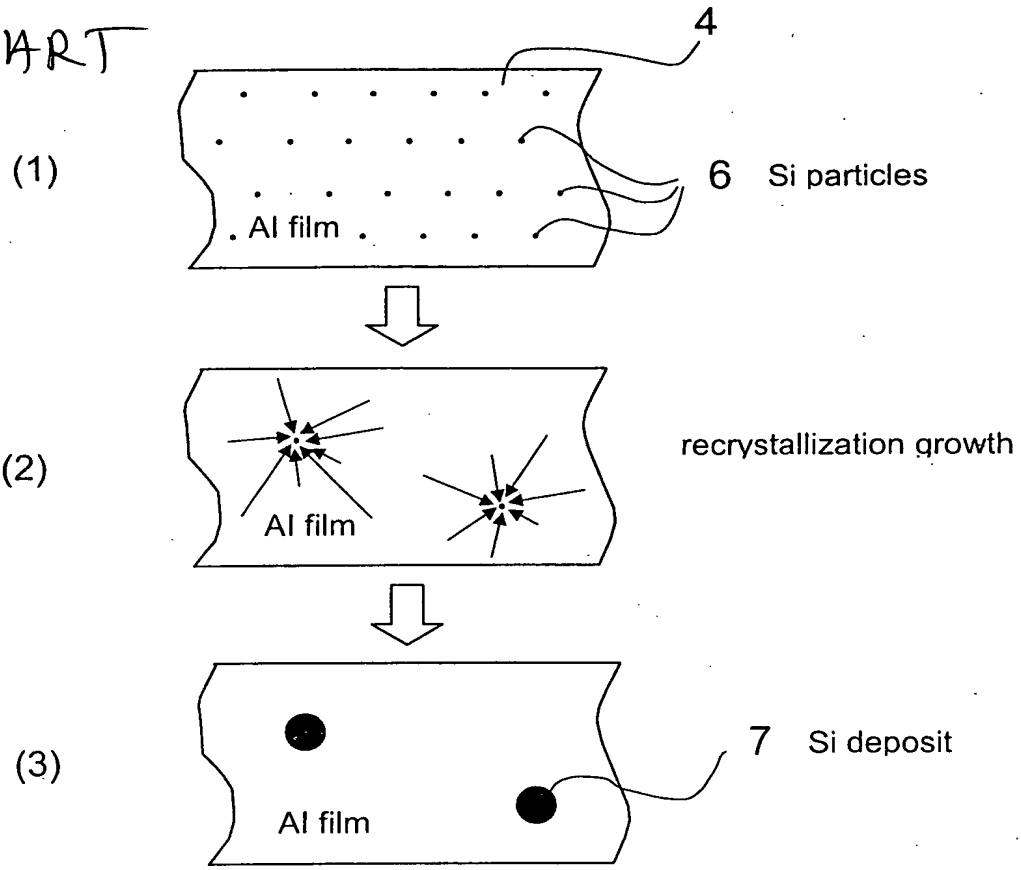


Fig. 5

PRIOR ART